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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.        | CONFIRMATION NO.  |
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| 09/659,604   | 09/11/2000  | David A. Greve       | 00CR029/KE                 | 4765              |
| 7590 04/20/2004  |             |                      |                            |                   |
| Kyle Eppele<br>Rockwell Collins Inc<br>400 Collins Rd NE<br>Cedar Rapids, IA 52498 |             |                      | EXAMINER<br>OPIE, GEORGE L |                   |
|  |             |                      | ART UNIT<br>2126           | PAPER NUMBER<br>5 |

DATE MAILED: 04/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

Applicant(s)

09/659,604

David A. Greve

Examiner

Art Unit

George L. Opie

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

**Status**

- 1) ☒ Responsive to communication(s) filed on 2 February 2004.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ☐ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ☐ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ☐ is/are objected to.
- 8) ☐ Claim(s) ☐ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ☐ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on ☐ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. § 119**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some \* c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☐ received in Application No. (Series Code / Serial Number) ☐.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

**Attachment(s)**

- 14) ☐ Notice of References Cited (PTO-892)                      17) ☐ Interview Summary (PTO-413) Paper No(s). ☐.
- 15) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      18) ☐ Notice of Informal Patent Application (PTO-152)
- 16) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ☐.                      19) ☐ Other:

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**DETAILED ACTION**

This Office Action is responsive to Amendment A, filed 5 February 2004.

1. Request for copy of Applicant's response on floppy disk:

Please help expedite the prosecution of this application by including, along with your amendment response in paper form, an electronic file copy in WordPerfect, Microsoft Word, or in ASCII text format on a 3½ inch IBM format floppy disk.

Please include all pending claims along with your responsive remarks. Only the paper copy will be entered -- your floppy disk file will be considered a duplicate copy. Signatures are not required on the disk copy. The floppy disk copy is not mandatory, however, it will help expedite the processing of your application. Your cooperation is appreciated.

2. The U.S. Patents used in the art rejections below have been provided as text documents which correspond to the U.S. Patents. The relevant portions of the text documents are cited according to page and line numbers in the art rejections below. For the convenience of Applicant, the cited sections are highlighted in the *text documents*. Consistent with Office procedure, the U.S. Patents corresponding to the *text documents* are also included with this action.

3. Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-2 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wahbe et al. (U.S. Patent 6,151,618) in view of Honcik et al. (U.S. Patent 5,761,625).

As to claim 1, Wahbe teaches a computing system comprising  
a first general purpose microprocessor further comprising a first set of native instructions (appropriately translated instructions are executable on processor 102, p7 55 – p8 11)  
a first virtual machine disposed in ROM, and executed by said first general purpose microprocessor (virtual machine of the present invention is a software

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implemented operating system ... designed for ... the Intel x86 series, p10 54 – p11 18)

a first predetermined subset of said first set of native instructions (Intel x86 instruction set, p12 36-52) wherein instructions in said first predetermined subset are likely to result in defects when executed (unsafe instructions, p15 24-32)

a first virtual machine instruction subset (safe ... virtual machine instruction set, p10 54 – p11 18) which includes said first set of native instructions, except for said first predetermined subset (eliminating support for general-purpose or global pointers, p5 19-36)

said first virtual machine instruction subset is used by said first virtual machine (safe sequence of machine executable instructions, p6 53 – p7 11).

Although Wahbe does not explicitly disclose the FAA certification recitations, it would have been an obvious modification from Wahbe's safe virtual machine teachings to apply this reduced instruction set system in an operational management facility for avionics. Wahbe provides a safe general purpose virtual machine, and this secure system would be ideal in an avionics environment with its fail-safe focus.

Honcik teaches the "Federal Aviation Administration" maintains strict specifications that govern safety qualifications for flight operations/instrumentalities by requiring "that software used with commercial aircraft must be officially certified", p2 13-29 which corresponds to the first virtual machine has received a certification by the FAA, in response to a written claim of an improved assurance level. It would have been obvious to combine Honcik's teachings with Wahbe because the safe virtual machine would provide an inexpensive "trusted" system worthy of FAA certification; in other words, Honcik would be able to incorporate the safe VM reduced instruction set in his avionics program and show that the safe general purpose virtual machine provides great flexibility while conforming to FAA regulations.

As to claim 2, Honcik teaches an "aircraft data management system" that would have been executed on Wahbe's safe general purpose virtual machine.

5. Claims 3-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wahbe and Honcik as applied to claim 2 and further in view of the Admitted Prior Art (APA) in the background of application.

As to claim 3, Wahbe teaches a second general purpose microprocessor which is dissimilar with respect to said first general purpose microprocessor (DEC Alpha processor, p10 54 – p11 18)

a second virtual machine executed by said second general purpose microprocessor (virtual machine 400, p9 36-47).

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Wahbe does not explicitly disclose the additional limitations detailed below.

The APA teaches "multiple dissimilar general purpose microprocessor architectures ... are used in parallel, and their outputs are compared" which corresponds to the means for synchronizing and voting outputs of said first general purpose microprocessor and said second general purpose microprocessor. It would have been obvious to combine the APA with Wahbe because the dissimilar architectures would avoid the problems that can surface from bugs that may arise within a particular processor.

As to claim 4, see the claim 2 rejection supra.

As to claim 5, see the claim 1 discussion supra.

As to claims 6-7, Wahbe teaches the "virtual machine is a metaprogram more generically known as an operating system.", p4 23 and from this, it would have been obvious for one skilled in the art to generate the VMs such that they are distinct compiled versions of an identical original VM code.

As to claims 8-10, the APA teaches the fundamental parallel processing concepts used in the area of avionics, and it would naturally have flowed from the referenced prior art to utilize the simultaneous data delivery and a programmable logic device for maximizing the system's efficacy.

As to claims 11-12, see the discussions of claims 6-7 supra, including the respective base claim and any intervening claims.

As to claims 13-14, Wahbe (p7 et seq.) teaches the use of memory arranged as recited, and the means for "voting" would have come from the APA's reference of this well known subject. Consequently, it would have been an obvious modification for one skilled in the art to provide the memory/voting arrangement as stipulated because the shared storage would be an effective mechanism for output after voting results, thereby making the shared memory a highly reliable production.

As to claim 15, Wahbe teaches the "Intel x86 series" serves as a means for processing, p10 54 – p11 18 as recited.

As to claim 16, Honcik teaches the "Federal Aviation Administration" maintains strict specifications that govern safety qualifications for flight operations/instrumentalities by requiring "that software used with commercial aircraft must be officially certified", p2 13-29 which corresponds to the first and second virtual machines have received FAA certification.

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As to claims 17-18, note the certification and VM instruction set discussion in claim 1 *supra*.

As to claim 19, note the rejection of claim 18 above. Claim 19 is the same as claim 18, except claim 19 is a method claim and claim 18 is an apparatus claim.

As to claim 20, Honcik teaches the flight management system application, p2 32-35.

6. The prior art of record and not relied upon is considered pertinent to the applicant's disclosure. Each reference disclosed below is relevant to one or more of the Applicant's claimed invention.

U.S. Patent No. 6,587,937 to Jensen et al. which teaches the virtual machines with shared storage in the avionics art;

U.S. Patent No. 6,317,872 to Gee et al. which teaches the reduced instruction set for improved computing security/integrity;

U.S. Patent No. 5,969,668 to Young which teaches the FAA certification process with flight programs;

U.S. Patent No. 5,761,477 to Wahbe et al. which teaches the high assurance virtual machines on general purpose computers.

## **7. Response to Applicant's Arguments:**

Applicant argues (claim 1) that Wahbe's teachings do not meet the claimed virtual machine limitations. Contrary to Applicant's contention, the Wahbe reference does teach the virtual machine using a subset of the native instructions as recited. The scope of the claimed "virtual machine instruction subset" clearly transcends the more narrow scope that Applicant attempts to impute through argument. Claimed subject matter, not the specification is the measure of the invention. Limitations in the specification cannot be read into the claims for the purpose of avoiding the prior art, *In re Self*, 213 USPQ 1,5 (CCPA 1982); *In re Priest*, 199 USPQ 11, 15 (CCPA 1978). The VM instruction subset limitations are clearly subject to a broad interpretation, as detailed in the rejections maintained above. The Examiner has a *duty* and *responsibility* to the public and to Applicant to interpret the claims *as broadly as reasonably possible* during prosecution (see *In re Prater*, 56 CCPA 1381, 415F.2d 1393, 162 USPQ 541 (1969) ). Plainly, the VM restricted instruction subset taught by Wahbe reads-on the limitation of a "virtual machine instruction subset" as claimed. The prior art clearly shows the safe subset of VM instructions for reliable computing commensurate with the claimed VM instruction subset that excludes certain predetermined instructions.

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Applicant argues (claim 19) that the prior art does not render obvious the claimed limitations of FAA communication in connection with avionics application assurance outputs from systems that run VMs. Despite Applicant's assertions, the admitted prior art, Wahbe and Honcik do describe VM operations associated with safe computing for the FAA that meets the claimed terms.

In considering the VM and FAA recitations, it is noted that Applicant uses terminology that has broad meaning in the art, and thus requires a broad interpretation of the claims in determining patentability of the disclosed invention. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. (In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993)). Applicant should set forth claims in language that clearly, distinctly, unambiguously and uniquely define the invention. The fact that Applicant has not narrowed the definition/scope of the current claims implies that Applicant intends an extensive coverage breadth of the claims, which is met by the cited prior art. Consequently, the FAA certification of VM-based systems, in the manner recited in the pending claims does not constitute a non obvious merit over the prior art.

Applicant's arguments, filed 5 February 2004, have been fully considered but they are not deemed to be persuasive. For the reasons detailed above, the rejections are maintained under **35 U.S.C. § 103 as** set forth supra.

8. THIS ACTION IS MADE FINAL.

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. § 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

Please help expedite the prosecution of this application by including, along with your amendment response in paper form, an electronic file copy in WordPerfect, Microsoft Word, or in ASCII text format on a 3½ inch IBM format floppy disk. Please include all pending claims along with your responsive remarks. Only the

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paper copy will be entered -- your floppy disk file will be considered a duplicate copy. Signatures are not required on the disk copy. The floppy disk copy is not mandatory, however, it will help expedite the processing of your application. Your cooperation is appreciated.

**Contact Information:**

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system.

Status information for published applications may be obtained from either Private-PAIR or Public-PAIR.

Status information for unpublished applications is available through Private-PAIR only.

For more information about the PAIR system, see  
<http://pair-direct.uspto.gov>.

Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

- ☐ All responses sent by U.S. Mail should be mailed to:  
**Commissioner for Patents**  
**PO Box 1450**  
**Alexandria, VA 22313-1450**
- ☐ Hand-delivered responses should be brought to Crystal Park Two, 2021 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist). All hand-delivered responses will be handled and entered by the docketing personnel. Please do not hand deliver responses directly to the Examiner.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

All OFFICIAL faxes will be handled and entered by the docketing personnel. The date of entry will correspond to the actual FAX reception date unless that date is a Saturday,



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Sunday, or a Federal Holiday within the District of Columbia, in which case the official date of receipt will be the next business day. The application file will be promptly forwarded to the Examiner unless the application file must be sent to another area of the Office, e.g., Finance Division for fee charging, etc.

- ☐ Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist at **(703) 305-9600**.
- ☐ Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Opie at (703) 308-9120 or via e-mail at *George.Opie@uspto.gov*. Internet e-mail should not be used where sensitive data will be exchanged or where there exists a possibility that sensitive data could be identified unless there is an express waiver of the confidentiality requirements under 35 U.S.C. 122 by the Applicant. Sensitive data includes confidential information related to patent applications.



**MENG-AL T. AN**  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2100